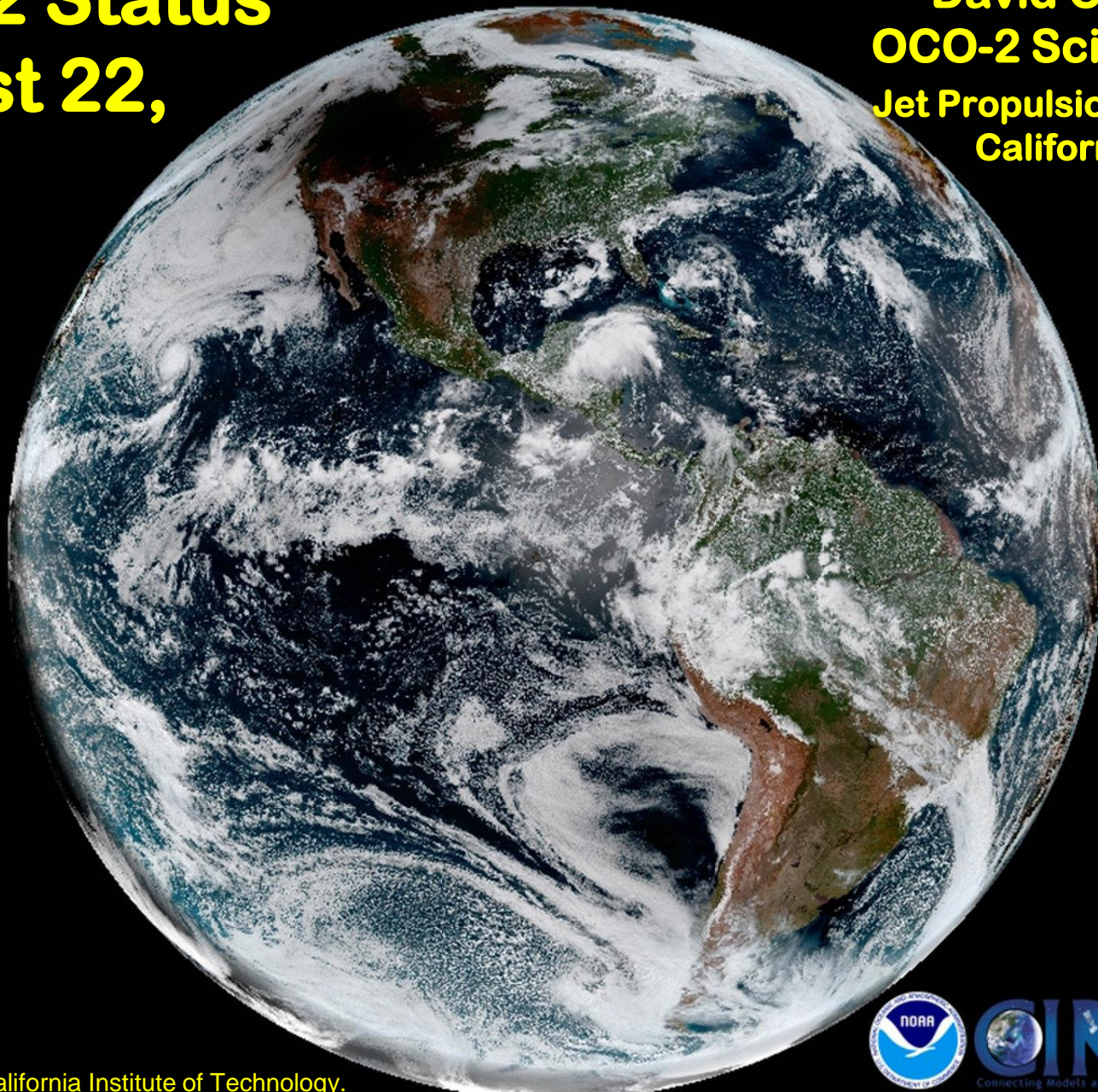


# OCO-2 Status

## August 22, 2017

**David Crisp for the  
OCO-2 Science Team  
Jet Propulsion Laboratory,  
California Institute of  
Technology**



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Government sponsorship acknowledged.



NOAA 16 Advanced Baseline Imager



# Overview

- **Observatory Status:**
  - Currently running a “command-only” sequence – no Science Ops
- **Instrument Status:**
  - Recovery from the July 30 instrument reset was suspended to address an anomaly with the baffle calibration position sensor
  - Plans to address the anomaly are in place and limited science observations will resume as early as Thursday or Friday of this week
- **V8 production is proceeding**
  - Level 2 B8r production expected to complete by end of September
  - Data filtering and bias correction efforts are ongoing
- **Planning for the October 25-27 Science Team Meeting**
  - Breakout session planning



## Instrument Status - Offline

- The instrument controller was reset on July 30 to address a commanding issue associated with a corrupted memory location and to perform a standard decontamination cycle
  - The reset successfully restored the corrupted memory, but the instrument reported that a potentiometer monitoring the calibration door position indicated that the door was in the wrong position
  - An investigation indicated that the potentiometer was failing
    - This is an issue for normal operations because the potentiometer is used by the flight software's fault detection system to verify that the solar diffuser is in place before we look at the sun for solar calibration.
    - An erroneous reading during a routine Solar Calibration maneuver will cause the instrument to shut down (and warm up)
    - Fortunately, the position of the calibration door can also be determined by counting steps executed by the stepper motor
    - However, a flight software change is needed to implement this fix, and this change will remove a (rare) backup system



# Instrument Anomaly Resolution Progress

- Two steps are being executed to resolve the calibration door potentiometer anomaly
  - A flight software change has been implemented that replaces the potentiometer position reading with a step count reading
    - This software change is being tested, and could be uploaded as soon as Thursday, August 24.
  - Because the A-band focal plane array could be damaged by viewing direct sunlight and potentiometer can no longer serve as a backup for verifying the position of the solar diffuser, the a flight software is being modified to point ~2.5 degrees away from the sun for routine solar calibration maneuvers
    - This change will preclude direct sunlight from entering the spectrometers even if the diffuser is not in position
    - It is expected to change the illumination level by much less than 1% when diffuser is in position, mitigating impacts on calibration
    - Unfortunately this change will take longer (5-6 weeks) to implement and test, delaying resumption of normal operations





# Instrument Anomaly Resolution Plans

- While the 2.5 degree solar off-pointing change is being developed and tested, the project has found a safe way to acquire limited science observations and the required solar and lamp calibration observations with a “human in the loop” approach
  - The diffuser door will be commanded to move from the Science (open) position to either the solar calibration (diffuser) or lamp calibration (closed) positions during the first X-band pass of the day and the calibration door motor will be turned off
  - The door position is verified manually by an operator on the 2<sup>nd</sup> (and last) X-band pass of the day. If it is in the correct position, solar, lamp or dark calibrations will be conducted for the **remainder of that day**
  - The door motor is turned on and the door will be opened to normal science operations during the first X-band pass on the following day
  - This approach is expected to provide normal science data for **5 out of 7 days each week** (nominally M,W,F,Sa,Su) until the software patch is completed and tested (nominally late September)
- This approach will be implemented as early as Thursday 7/24



## Status of V8 Processing





# V8 data product development

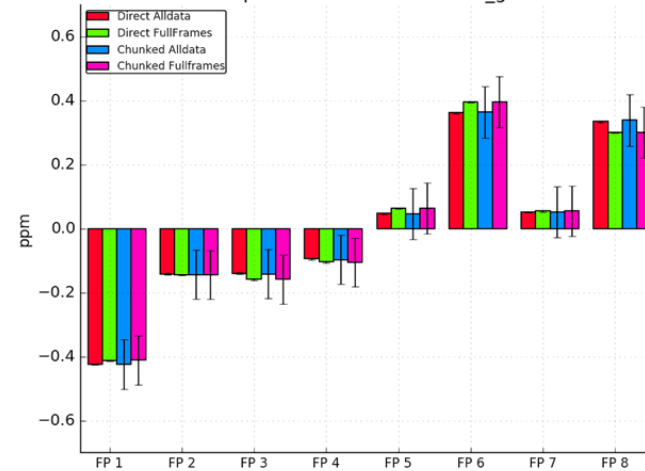
- V8r processing is ongoing!
  - Using OCO-2 cluster, NASA supercomputer, and Amazon cluster
  - Bias Correction looks stable and well behaved.
    - Remarkable similarity between glint and nadir land.
    - Footprint-to-footprint differences vanishingly small after bias correction. Separate correction unnecessary.
    - Ongoing work on TCCON alignment for all modes
- V8r L1b data product - June 2015 - June 2017 complete
- V8r L2 data production has started
  - 4 months 100% complete, 6 more months >50% complete as of 7/21
  - Completion still targeted for the end of September
- Lite file production to follow.



# Raw XCO2 FP Bias

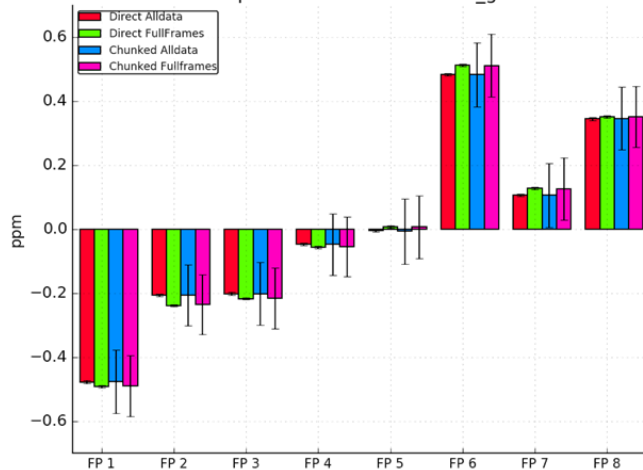
- Build Raw xCO2 intuition first
- Pretty typical FP bias pattern
- FP 1, 6, and 8 are outliers
- Span is  $\sim 1$  ppm
- Colors are 4 methods
- “Direct” is just mean and stderr of FP
- “Chunked” uses 50% of data 70 ways
- “Alldata” uses all available data (imbalanced)
- “FullFrames” only uses frames w/ 8 soundings

Footprint Bias Estimations sea\_glint



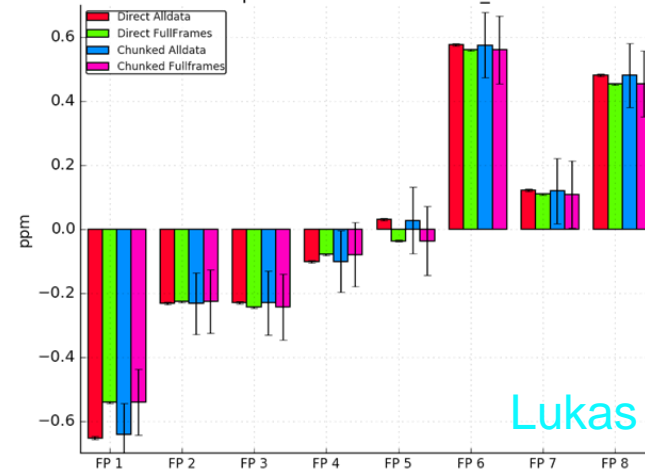
LM  
170821  
v7

Footprint Bias Estimations Ind\_glint



LM  
170821  
v7

Footprint Bias Estimations Ind\_nadir



LM  
170821  
v7

Lukas Mandrake

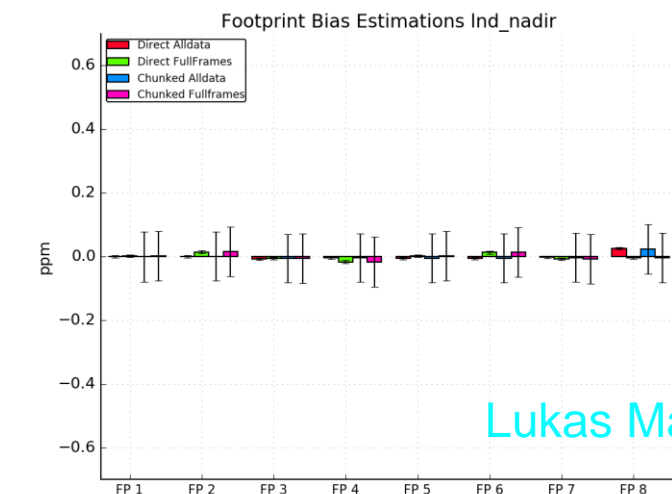
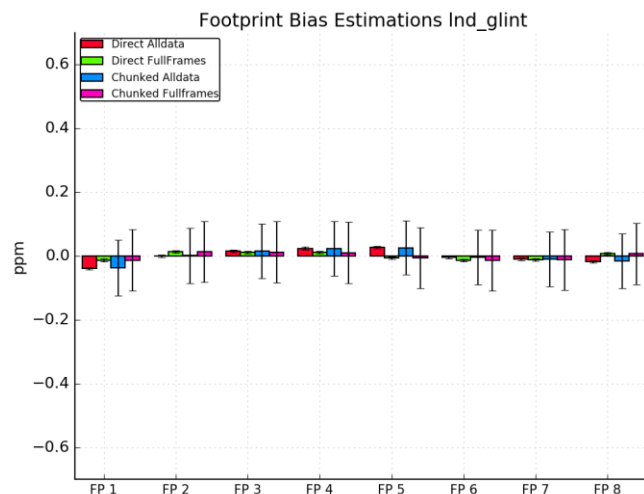
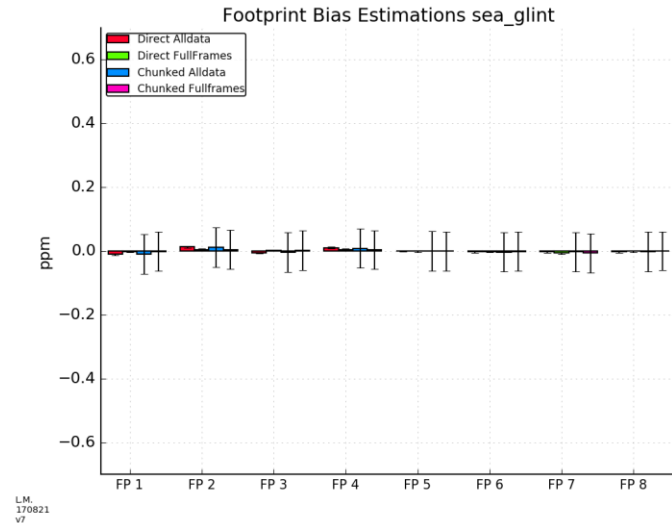






# XCO2 FP Bias after Bias Correction

- Now apply BC Feats trend removal
- Shocking reduction in footprint bias
- FP 1, 6, and 8 are outliers
- Span is  $\sim 0.05$  ppm
- Effectively no FP bias remaining!
- How could this be?
- Hint: Footprint showed up in SVEGO runs!
- Hint: Chris found “FP mean removed” vars



Lukas Mandrake

L.M. 170821 v7

L.M. 170821 v7

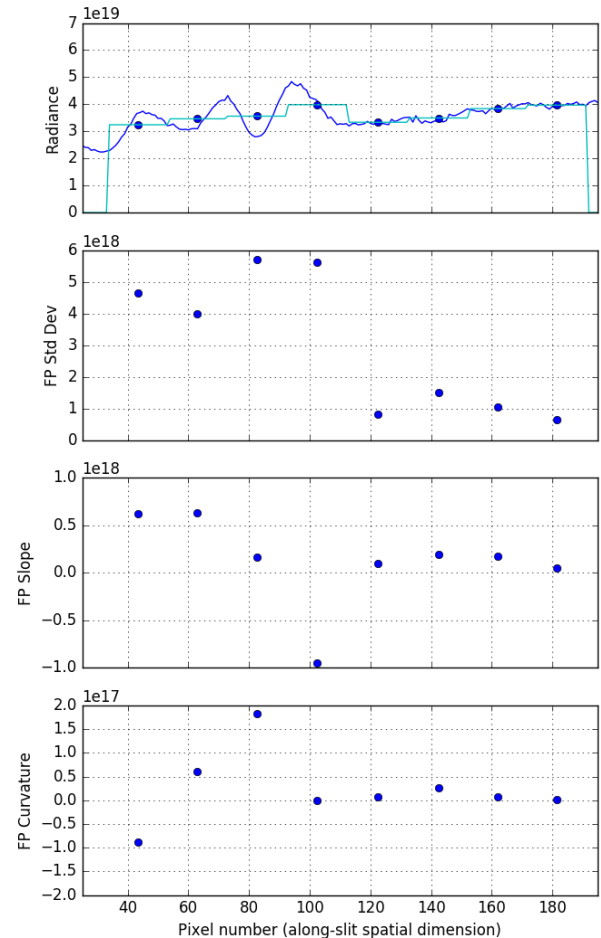




## Other Recent Progress

- Aronne Merrilli, Tommy Taylor, and Chris have been using “MaxDeclockingFactors” (MDF) and color slices (CS) to study scene heterogeneity
  - MDF – 1 is highly correlated with CS slope, but CS slope is not well correlated with CS curvature
  - MDF – 1 and CS clearly correlated with regions of high spatial heterogeneity (broken clouds, coastlines, surface albedo features)
- More study is needed, but this may lead to more effective screening in a future product

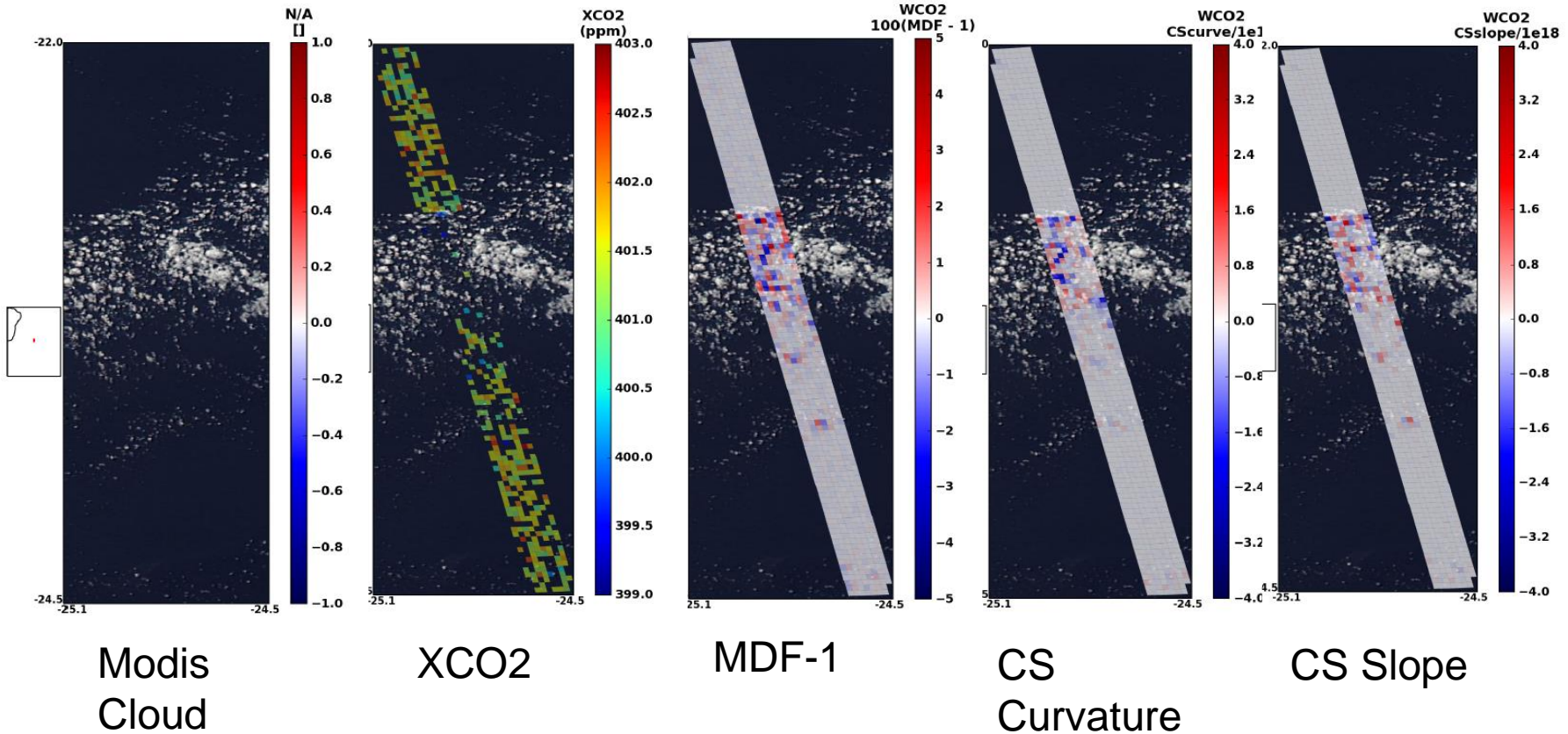
oco2\_L1bScGL\_11629a\_160907\_B7302r\_161007013226\_csstats.h5  
WCO2, frame num = 2944, sndid = 2016090720180471-8





# Glint Example

2016-09-07 GL 11626 011







# Science Team Meeting Planning



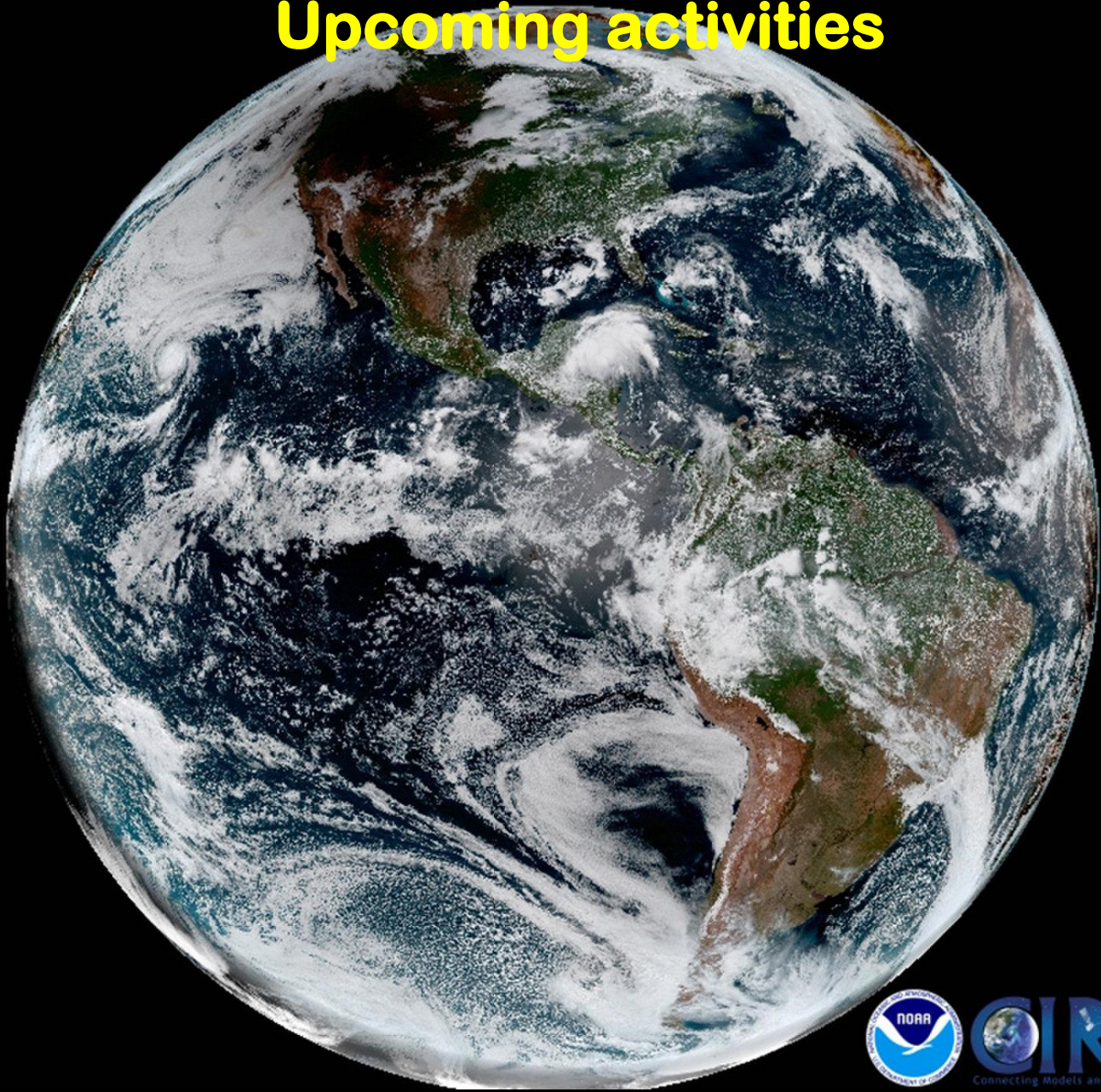




# Science Team Meeting Plans

- October 25th, 26th, and 27th (until noon, followed by a GeoCarb Science Team Meeting) at the NCAR Mesa lab
- The meeting will include plenary, breakouts on select topics, posters, and the popular speed talks!
- All members of the selected science team (or their representatives) are required to summarize their progress and plans in some format (speed talk, poster, or oral presentation)
  - Please submit your preference and abstract on the registration page.
- Registration and Abstract Page:  
<https://sites.google.com/view/oco2stm1017/register-abstracts>
- Theme Group Breakout Meetings
  - Flux (Tuesday afternoon)
  - Cloud/Aerosol (Tuesday afternoon)
  - Others?

# Upcoming activities



NOAA 16 Advanced Baseline Imager



# OCO-2 Team Activities

- Upcoming Meetings
  - 21-25 August, ICDC10, Interlaken, Switzerland
  - 11-14 September, 2017 CEOS SIT Technical Workshop, Frascati, Italy
  - 2-6 October, EUMETSAT-2017, Rome, Italy
  - 25-27 October 2017, OCO-2 Science Team Meeting, NCAR, Boulder, CO, USA
  - 11-15 December, 2017: AGU Fall Meeting, New Orleans, LA, USA
  - 7-11 January, 2018: MS Annual Meeting, Austin, TX, USA



# Aircraft Campaigns of Interest to GOSAT and OCO-2

- **ASCENDS Alaska Campaign: July 27 – August 8**
  - **OCO-2 was in service for the Engineering flight (7/20), Calibration Flight (7/21), and transit from Palmdale to Fairbanks (7/27), but missed the remainder of this successful campaign**
- **ACT-America Campaign#3: October 3 – November 13.**
  - LaRC: 2-16 October
  - Lincoln Nebraska: 17-30 October
  - Shreveport, Louisiana: 31 October – 13 November
  - The ACT-America calendar is here:  
<https://actamerica.larc.nasa.gov/calendar.html>
- **ATom-3: 1-26 October**
  - Preceded by shakedown and test flights from September 12-28.
  - ATom-1 data are public, see
  - <https://espoarchive.nasa.gov/archive/browse/atom>
  - ATom-3 calendar is here:
  - <https://espo.nasa.gov/atom/calendar/2017-09>